Claims

1. A water propulsion unit comprising an intake housing, a pump housing, an outlet housing, an upstream impeller and a downstream impeller,

said upstream and downstream impellers being spaced apart and located within the pump housing between the intake housing and the outlet housing, each impeller including a series of impeller blades extending radially from a central boss, the blades of the upstream impeller being of opposite pitch to the blades of the downstream impeller;

wherein said impellers are mounted on and, in use, driven by shafts so as to be co-axial with each other, within the pump housing;

wherein the impellers are configured such that in use one of the impellers will impart less energy to the water passing that impeller than the remaining impeller;

and the upstream impeller in use will create a drop in pressure upstream of said upstream impeller and impart a rapid change in velocity to the water as it passes over the blades.

2. The water propulsion unit of claim 1, wherein the downstream impeller is adapted to remove a substantial amount of the radial energy in the water as it passes the downstream impeller,

3. A vessel propulsion unit including
an upstream impeller and a downstream impeller,
a pump housing,
a water inlet to communicate with the upstream impeller and
an outlet to communicate with the downstream impeller,
the said impellers being spaced apart and having concentric axes and being adapted to be rotated within the pump housing in opposite directions, and
wherein the blades of one impeller are of opposite pitch to the blades of the second impeller,
characterised in that one of the impellers is arranged to impart less energy to the water than the other impeller.

4. The water propulsion unit of claim 1, wherein the unit is configured so the suction generated by the downstream impeller in the area between the upstream impeller and the downstream impeller is controlled.

5. The water propulsion unit of claim 1, wherein the downstream impeller imparts greater energy to the water than the upstream impeller.

6. The water propulsion unit of claim 1, wherein one of the impellers is formed with fewer blades than the other impeller.

7. The water propulsion unit of claim 6, wherein the upstream impeller has fewer blades than the downstream impeller.

8. The water propulsion unit of claim 1, wherein one of the impellers has blades of a closed configuration and the second impeller has blades of an open configuration.

9. The water propulsion unit of claim 1, wherein the blades of the upstream and the downstream impellers are of open configuration.

10. The water propulsion unit of claim 1, wherein a clearance is left between the tips of the blades of one of the impellers and the inner wall of the pump housing.

11. The water propulsion unit of claim 1, wherein the rotational speed of the downstream impeller is less that the rotational speed of the upstream impeller.

12. The water propulsion unit of claim 1, wherein both impellers are mounted on concentric counter-rotating shafts.

13. The water propulsion unit of claim 1, wherein the two impellers are driven from a single engine through reduction gearing to provide the desired ratio of rotational speeds between the upstream and downstream impellers.

14. The water propulsion unit of claim 1, wherein the ratio of rotational speeds between the downstream and the upstream impellers is fixed.

15. The water propulsion unit of claim 13, wherein the ratio of rotational speeds between the downstream and the upstream impellers can be altered.

16. The water propulsion unit of claim 15, wherein each impeller is driven by a separate engine.

17. The water propulsion unit of claim 1, wherein the intake housing is bulged outwardly upstream of the upstream impeller.

18. The water propulsion unit of claim 1, wherein means are provided to vary the cross sectional area of the interior of the pump housing between the upstream and the downstream impellers.

19. The water propulsion unit of claim 1, wherein means are provided to vary the cross sectional diameter of the outlet.

20. The water propulsion unit of claim 18, wherein the cross sectional area of the outlet can be varied to an optimum size to allow the maximum amount of water to exit the unit while also controlling ventilation.

21. The water propulsion unit of claim 1, wherein the upstream and the downstream impellers are both of axial flow configuration.

22. The water propulsion unit of claim 1, wherein the upstream impeller is of mixed flow configuration and the downstream impeller is of axial flow configuration.

Claims as amended under Article 34

1. A water propulsion unit including

an upstream impeller and a downstream impeller,

a pump housing,

a water inlet to communicate with the upstream impeller and

an outlet to communicate with the downstream impeller,

the said impellers being mounted on and, in use, driven by shafts so as to be co-axial with each other, within the pump housing; said impellers are spaced apart and are adapted to be rotated within the pump housing in opposite directions, and wherein each impeller includes a series of impeller blades extending radially from a central boss, and the blades of the upstream impeller are of opposite pitch to the blades of the downstream impeller,

characterised in that, one of the impellers is arranged to impart less energy to the water than the other impeller; and

wherein the cross-sectional area of the outlet is such that in use it presents minimal impedance to the flow of water therethrough.

2. The water propulsion unit of claim 1, wherein the downstream impeller is adapted to remove a substantial amount of the radial energy in the water as it passes the downstream impeller,

3. The water propulsion unit of claim 1 wherein it is used as a vessel propulsion unit.

4. The water propulsion unit of claim 1, wherein the unit is configured so the suction generated by the downstream impeller in the area between the upstream impeller and the downstream impeller is controlled.

5. The water propulsion unit of claim 1, wherein the upstream impeller imparts greater energy to the water than the downstream impeller:

6. The water propulsion unit of claim 1, wherein one of the impellers is formed with fewer blades than the other impeller.

7. The water propulsion unit of claim 6, wherein the upstream impeller has fewer blades than the downstream impeller.

8. The water propulsion unit of claim 1, wherein one of the impellers has blades of a closed configuration and the second impeller has blades of an open configuration.

9. The water propulsion unit of claim 1, wherein the blades of the upstream and the downstream impellers are of open configuration.

10. The water propulsion unit of claim 1, wherein a clearance is left between the tips of the blades of one of the impellers and the inner wall of the pump housing.

11. The water propulsion unit of claim 1, wherein the rotational speed of the downstream impeller is less that the rotational speed of the upstream impeller.

12. The water propulsion unit of claim 1, wherein both impellers are mounted on concentric counter-rotating shafts.

13. The water propulsion unit of claim 1, wherein the two impellers are driven from a single engine through reduction gearing to provide the desired ratio of rotational speeds between the upstream and downstream impellers.

14. The water propulsion unit of claim 1, wherein the ratio of rotational speeds between the downstream and the upstream impellers is fixed.

15. The water propulsion unit of claim 13, wherein the ratio of rotational speeds between the downstream and the upstream impellers can be altered.

16. The water propulsion unit of claim 15, wherein each impeller is driven by a separate engine.

17. The water propulsion unit of claim 1, wherein the intake housing is bulged outwardly upstream of the upstream impeller.

18. The water propulsion unit of claim 1, wherein means are provided to vary the cross sectional area of the interior of the pump housing between the upstream and the downstream impellers.

19. The water propulsion unit of claim 1, wherein means are provided to vary the cross sectional diameter of the outlet.

20. The water propulsion unit of claim 18, wherein the cross sectional area of the outlet can be varied to an optimum size to allow the maximum amount of water to exit the unit while also controlling ventilation.

21. The water propulsion unit of claim 1, wherein the upstream and the downstream impellers are both of axial flow configuration.

22. The water propulsion unit of claim 1, wherein the upstream impeller is of mixed flow configuration and the downstream impeller is of axial flow configuration.